
Clean Coke
Presented at
Utah Governor's Energy Development Summit: 201
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Clean Coke Process

- Produces high quality metallurgical coke
- Significant reduction in pollutant emissions (95+%)
- Significantly lower production costs (50%)
- Can utilize waste coal material
  - ✓Environmental remediation
  - ✓Lower cost feedstock

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Clean Coke Process

1. Patented process
2. Developed by Combustion Resource, Inc. (Provo, UT)
3. IP donated to Utah State University (USU)
4. Marketing and funding led by USU-CRD
5. Continued R&D led by Combustion Resources, Inc.

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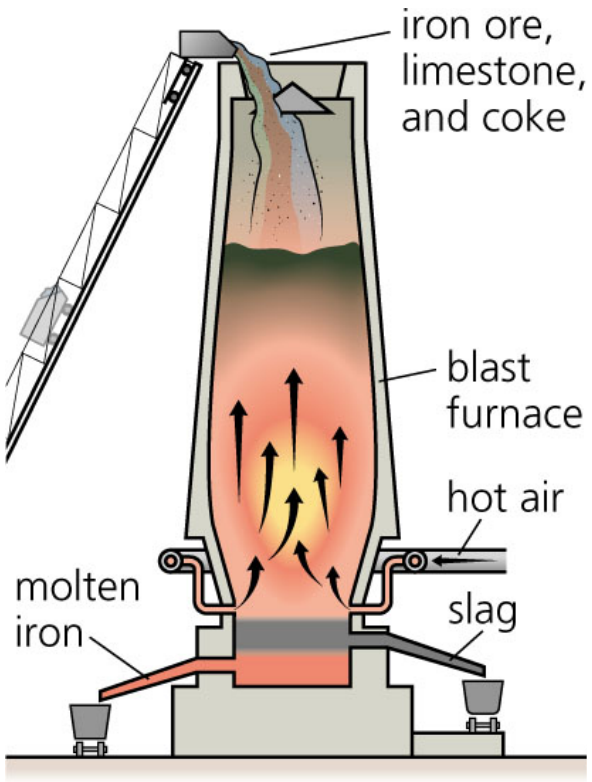
What Is Metallurgical Coke?

1. Used for manufacturing steel
2. Approximately 0.35 t coke / t steel
3. No clear alternative to coke in future
4. World consumption ~490 Mt in 2012
5. U.S. consumption ~15 Mt in 2012



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How Is Conventional Coke Produced?

1. Coke oven batteries
2. High capital costs
3. Expensive feedstock (swelling, caking coals) ~$170/ton
4. Batch process with high pollution emissions
5. 15-20% product unusable

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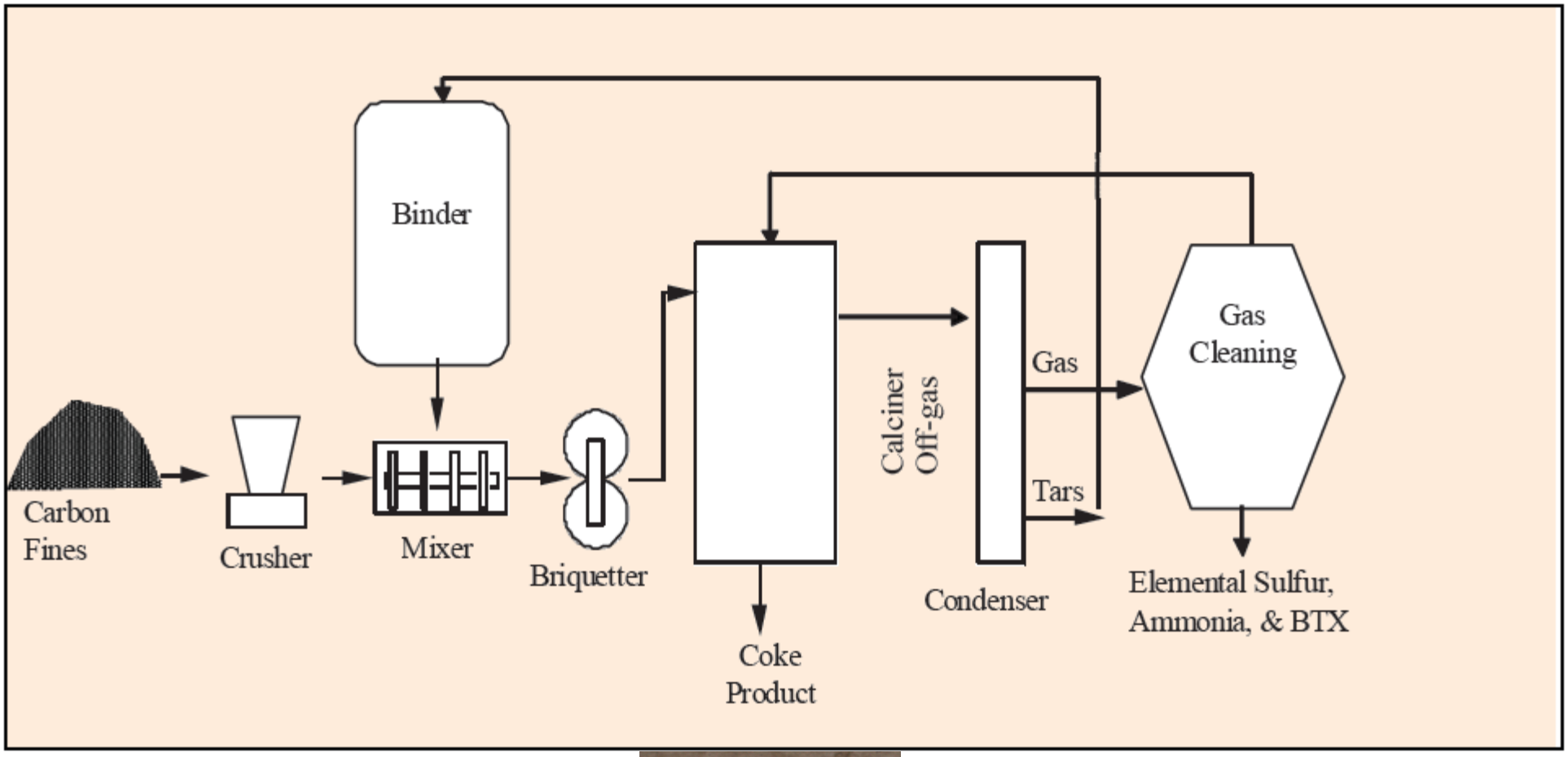
Clean Coke Process



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Advantages of Clean Coke Process

1. Can use non-coking coals (less expensive feedstock)
2. Environmentally-friendly process
    a. Continuous process, very low emissions
    b. Can utilize waste coal fines as feedstock
3. Lower capital costs
4. Consistently high-quality, uniform product
5. Can build smaller, modular production units

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Coal Fines

1. Clean Coke Process can use coal fines as low cost feedstock
2. 50 million tons produced annually
3. 2.5 billion tons stockpiled in eastern United States
4. Use of fines provides environmental remediation

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Clean Coke Economics

120,000 tpy Plant

- Capital Investment = $42M
- Annual Sales = $47M
- Gross Margin as percent of sales = 70%
- Net Income = $17M
- Net Income as percent of sales = $37%
- Payback Period (years) = 1.6

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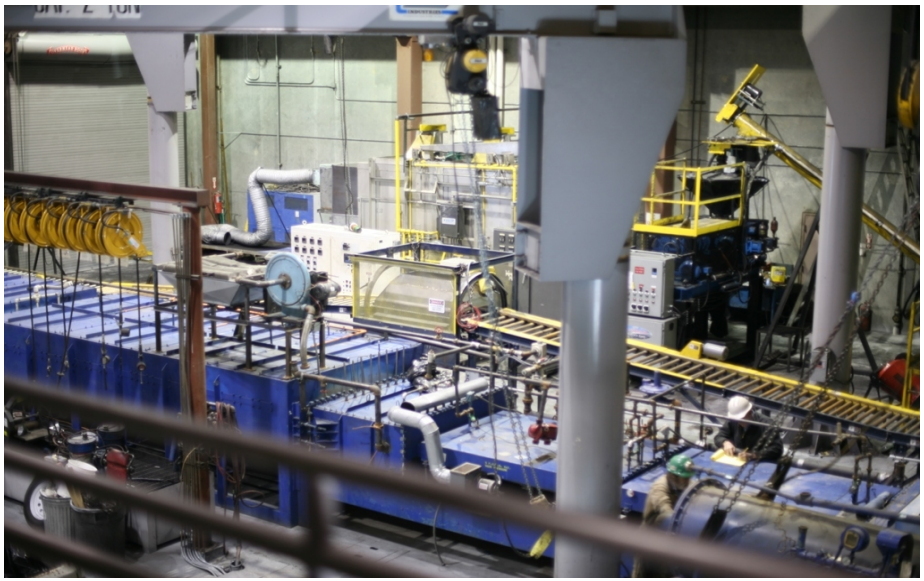
Pilot-Plant Currently Being Constructed at USU's CEIC Facility

1. Demonstrate process on production-scale
2. Produce sufficient quantities for testing in blast furnaces
3. Provide operating experience and scaling information
4. Serve as test facility for evaluating different feedstocks



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Summary: Clean Coke provides superior alternative to conventional coke production

1. Produces uniform, high-quality metallurgical coke
2. Better economics
    a. Lower capital costs
    b. Lower production costs
3. Continuous, environmentally-friendly process
    a. Very low pollution emissions
    b. Reclaims waste coal fines

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Thank you!!
Questions?
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Clean Coke Product

Quality Testing

Parameter	Industry Spec	CR Coke	Result
• CRI	<30	24-30	complies
• CSR	60+	60-79	complies
• Stability	60+	60-73	complies
• Hardness	70+	72-75	complies
• Volatile Content	-1%	0.2-0.9%	complies
• Fixed Carbon	+80%	95-96%	complies
• Ash	<10%	2-5%	complies
• Sulfur	<0.8%	0.76-1%	complies
• Alkalis	<0.3%	0.03%	complies
• Phosphorus	<0.15%	0.0007%	complies

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Clean Coke Product

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